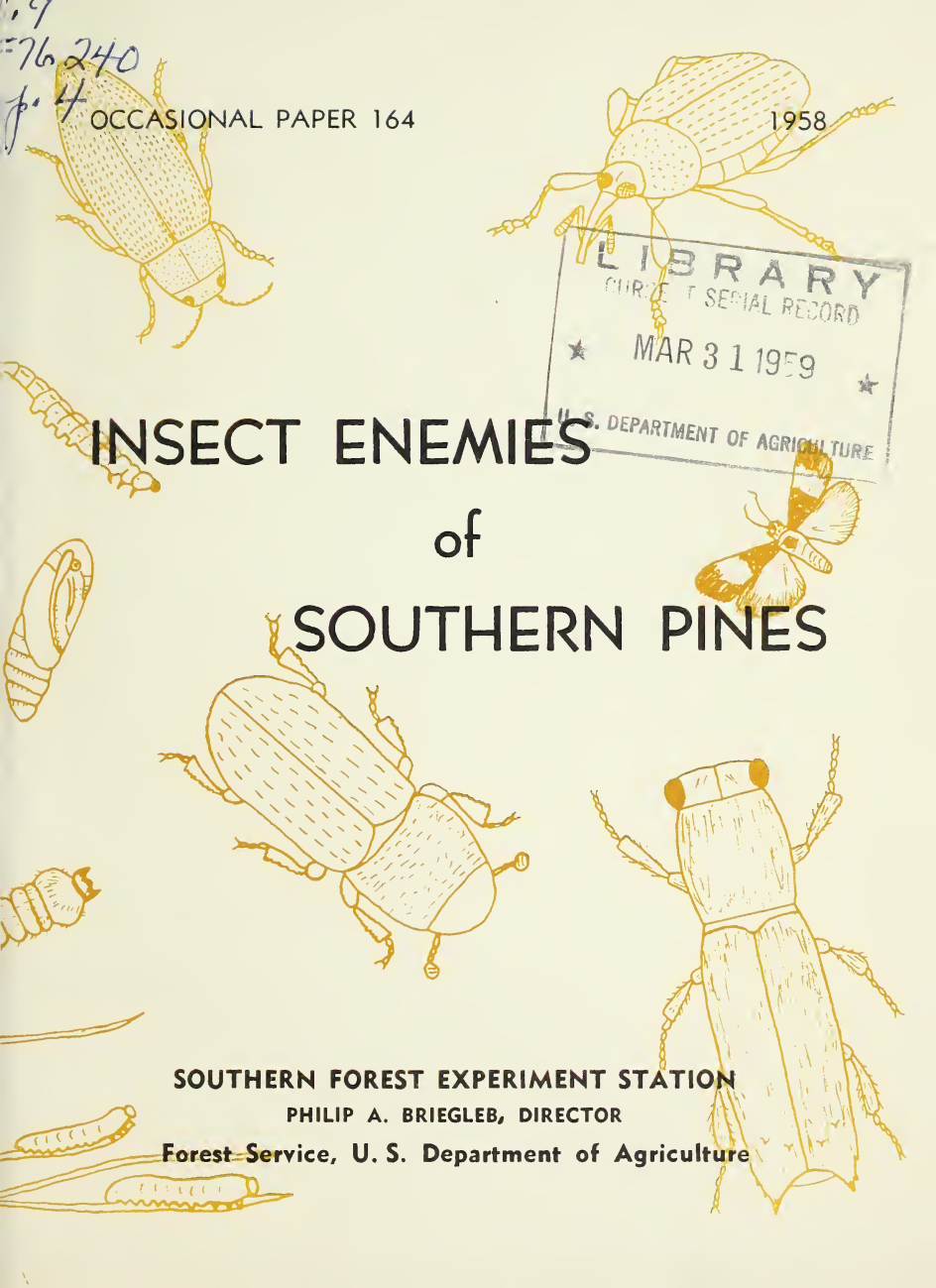
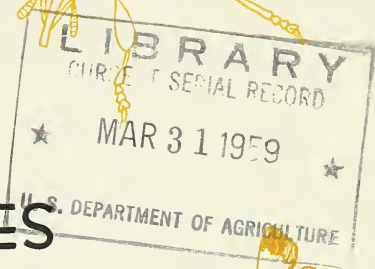


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INSECT ENEMIES of SOUTHERN PINES

SOUTHERN FOREST EXPERIMENT STATION

PHILIP A. BRIEGLER, DIRECTOR

Forest Service, U. S. Department of Agriculture

CAUTION!

THE INSECTICIDES MENTIONED IN THIS PUBLICATION ARE POISONS. USE THEM ACCORDING TO THE SAFETY INSTRUCTIONS ON THE CONTAINER. AVOID INHALING THE DUSTS OR SPRAYS. IF YOU CONTAMINATE YOUR SKIN WITH CONCENTRATED INSECTICIDES, WASH IMMEDIATELY WITH SOAP AND WARM WATER. AVOID WEARING CONTAMINATED CLOTHING.

METHYL BROMIDE, AS RECOMMENDED FOR THE CONTROL OF THE TEXAS LEAF-CUTTING ANT, IS A POISONOUS GAS. DO NOT STORE METHYL BROMIDE IN BUILDINGS WHERE PEOPLE LIVE OR WORK, AND DO NOT INHALE THE GAS. IT IS BEST TO USE A PREPARATION CONTAINING A SMALL AMOUNT OF CHLOROPICRIN (TEAR GAS) TO SERVE AS A WARNING AGENT, SINCE METHYL BROMIDE ALONE HAS VERY LITTLE ODOR.

INSECT ENEMIES OF SOUTHERN PINES

William H. Bennett
Charles W. Chellman
William R. Holt

Southern Forest Experiment Station

This publication brings together information on the identification, habits, and control of the most common insect enemies of southern pines. With very slight changes, it is a combination of Numbers 10, 19, and 21 of the SOUTHERN FOREST PEST REPORTER. It is intended as an identification aid and reference for woods workers, forest managers, and others interested in protecting forests from insect damage.

Some of the insects discussed are usually not considered serious. Generalizations about the importance of an insect, however, may be short-lived. Occasionally, large populations of a so-called minor insect build up in limited areas or on individual trees. Or there is always the possibility that a small, widespread insect population may develop into a serious menace to vast forest areas within a short period. The black turpentine beetle, currently the most troublesome insect enemy of southern pines, was once of little significance.

Reports of any unusual insect conditions will be gratefully received at the Southern Forest Experiment Station.

PINE INSECTS OF THE SOUTH

INSECT	SYMPTOMS	PAGE
Southern Pine Beetle Bores under bark and girdles trees of various sizes. Usually attacks middle of trunk and spreads up and down. Out of control, it can kill millions of dollars worth of green timber.	Small, reddish to white pitch-tubes on bark. Sometimes just boring dust. S-shaped and criss-crossed tunnels engraved in inner bark. Beetles brown to black, about 1/8-inch long; rounded hind end; minute notch on front of head when viewed from above.	4
Ips Engraver Beetle Bore under bark and girdle trees of small and commercial size. Not as spectacular as the southern pine beetle but present all the time and do considerable damage.	Small, reddish to white pitch-tubes on bark of trunk. Sometimes just boring dust in cracks of bark and on ground. Y- or H-shaped tunnels, almost straight and parallel with wood grain, on inside bark. Beetles light to dark brown or black, 1/4-inch long or less; hind end cut-off and shovel-shaped.	7
Black Turpentine Beetle Girdles inner bark of stumps and butts of large trees. Following logging, fires, etc., the insect may increase and kill trees, especially trees that have been scarred, turpentine-faced, or otherwise damaged.	Large, sugar-like pitch-tubes on stumps and lower trunk. Hard particles of resin at tree base. Tunnels on inner bark are more or less shapeless, and contain considerable pitch; larvae feed in groups and eat out whole patches of inner bark. Beetles brown to black, about 1/4- to 1 1/3-inch long.	10
Southern Pine Sawyer Round-headed borer; tunnels in dead and dying trees and fresh-cut logs. The tunnels cause severe defects in lumber.	Pencil-size and larger holes in sapwood and heartwood, with coarse excelsior-like frass. Funnel-shaped holes in bark where eggs have been deposited.	14
Turpentine Borer Flat-headed borer in fire-scarred and turpentine trees. Degrades lumber and weakens stems so that they may break from wind or ice.	Elliptical emergence holes on fire scars and particularly in turpentine faces. Larval tunnels filled with tightly packed fine frass and resin. Trees broken off about breast high during high winds.	16
Ambrosia Beetles Pin-hole borers in dying trees, logs, and unseasoned lumber. Make small holes in the wood and introduce a dark stain.	Pin-hole damage and black stain in lumber. Piles of fluffy white boring dust on ground and in bark crevices of infested trees and logs.	18
Nantuxet Pine Tip Moth Bud and shoot destroyer of seedlings and saplings. Causes the trees to become bushy and stunted. Growth loss may be severe.	Undeveloped buds and dead shoots hollowed out. White crust of resin near bud. Small, yellowish to brown larvae or pupae inside bud or shoot. Moth about 1/4-inch long, reddish-brown with silver-gray markings. Flies around foliage at dusk during summer.	20
Bark Weevils External bark feeders and girdlers of seedlings. Most destructive during the spring following fall or winter cutting.	Planted or natural seedlings with bark girdled externally above or below ground line. Weevils dark brown to black, 1/4- to 1/2-inch long; prominent beak; feed at night and in cloudy weather; commonly breed in stump roots.	22
White Grubs Root feeders on nursery seedlings and young plantation stock.	Foliage of seedlings fading and dying. Roots girdled or chewed off. White grubs in soil near roots. Adults (May beetles) attracted to lights; feed on foliage of hardwoods.	24

BARK BEETLES

WOOD BORERS

ROOT, TWIG, AND EXTERNAL BARK FEEDERS

Red-headed Pine Sawfly Needle chewer. Trees are weakened and occasionally killed by repeated defoliation. Growth loss may be severe.	Needles chewed to short stubs; manure pellets on ground. Masses of worm-like larvae feed together; red-brown heads, yellow bodies with black spots; about an inch in length; many small legs.	25
Loblolly Pine Sawfly Needle chewer. Prefers loblolly pine. Defoliates pines from March to May, causing heavy growth losses.	Needles chewed and trees defoliated, manure pellets on ground. Groups of worm-like larvae up to about an inch in length; red-brown heads; bodies dull green and gray striped; many small legs on body. Difficult to see on foliage.	26
Black-headed Pine Sawfly Needle chewer.	Larvae same as above except with black heads and black spots along sides of green and gray striped body.	26
Pine Webworm Defoliates seedlings in nurseries and young plantations.	Seedlings have masses of silk webbing mixed with excrement pellets.	28
Texas Leaf-Cutting Ant Defoliates seedlings during winter. Serious problem in parts of Louisiana and Texas.	Needles, bark, and buds removed from natural and planted seedlings. Large red-brown ants live in towns made up of many conspicuous mounds.	30
Pine Collapsis Beetle Feeds on needles of natural and planted re- production and larger trees.	Needles appear as if singed by fire and are highly reflective at night. Symptoms most noticeable in June and July.	33
Pine Needle Miner Borrows and feeds within needles. Probably causes growth loss.	Conspicuous browning and yellowing of needles. Partly hollowed needles with excrement particles and minute holes.	34
Pine Pitch Midge Attacks twigs and lives in glob of resin. Common but of little economic importance.	Small masses of semi-fluid resin containing yellowish-orange larvae with occasional swelling of plant tissue. Twigs sometimes swell under the pitch glob.	34
Scale Insects Suck sap from needles and twigs. Occasionally become very numerous, reducing tree vigor and killing young pines.	Scale-like insects covering needles or twigs. Fading or browning foliage in severe infestation with honeydew present.	34
Aphids Suck sap from needles, bark, roots. Cause growth loss and malformation of infested parts.	Soft-bodied plant lice on foliage or bark. Honeydew present.	34
Spider Mites Suck sap from needles and twigs. Sometimes kill ornamental conifers.	Spotty, pale-green and brown foliage. Fine webbing with cast skins and eggs or mites on needles or twigs.	35

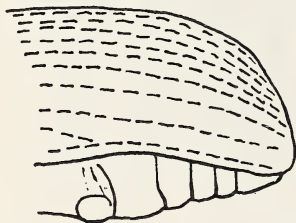
SOUTHERN PINE BEETLE

Dendroctonus frontalis

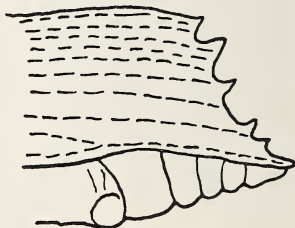
Importance. -- The southern pine beetle is considered to be the most destructive forest insect in the South. It attacks pines of all sizes and can kill apparently vigorous trees. It is especially dangerous following prolonged drouth, but sometimes reaches epidemic status without obvious reason.

The beetle carries with it a blue-stain fungus that hastens the death of trees and lowers their lumber value.

Habits. -- The beetle is about 1/8-inch long, brown or black. Its hind end is rounded, in contrast to the chopped-off posterior of *Ips* beetles (below). When the beetle is viewed from above with a hand lens, a minute notch may be seen on the front of the head.



Side view of hind end of southern pine beetle (greatly enlarged).



Side view of hind end of *Ips* beetle (greatly enlarged).

The beetles construct S-shaped, criss-crossed tunnels in the inner bark and kill the tree by girdling it and introducing a blue-stain fungus. Eggs are deposited in niches along the tunnels and larvae soon develop from them. Larvae usually feed within the bark, where they change to pupae and finally transform to beetles. In warm weather the life cycle is completed in 30 to 40 days. There may be 5 or 6 generations a year.

The beetle kills trees in groups that vary in size from a few trees to many thousands. Population trends are violent and hard to predict. Buildups are fast and often without apparent reason. When the epidemic has run its course, the insects sometimes disappear as rapidly as they came; in some years it is almost impossible to find any beetles at all.

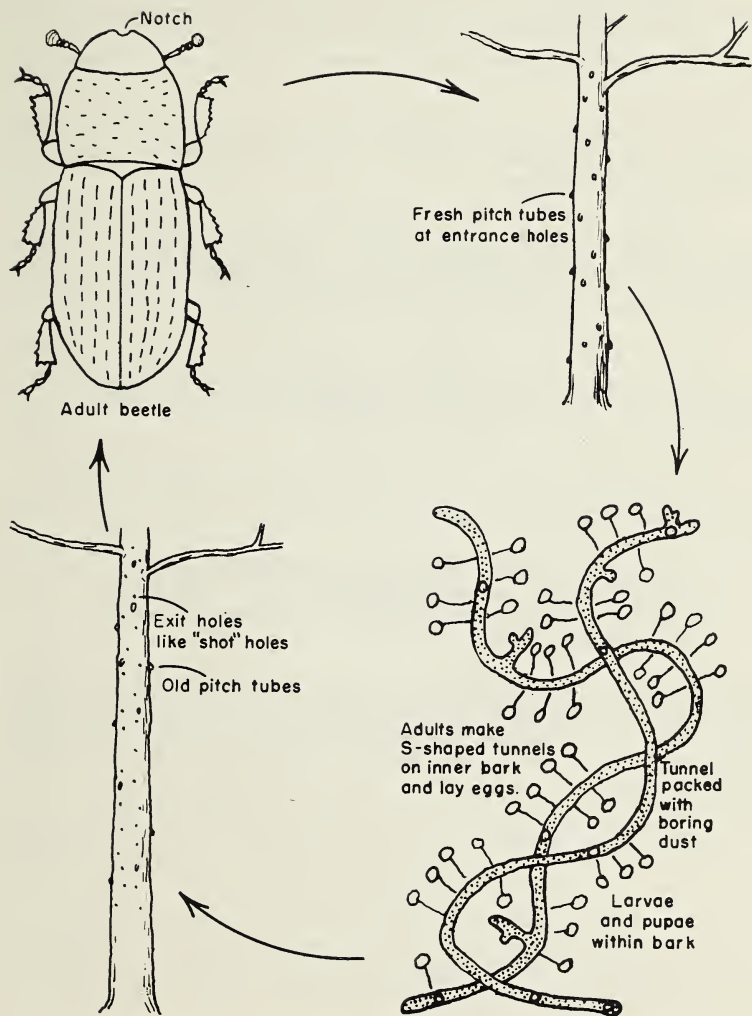


Figure 1.--Southern pine beetle.

Signs of attack. -- The earliest signs of infestation are numerous white, yellow, or sometimes red-brown pitch tubes, about as large as a wad of gum, scattered over the bark of the main stem. In trees of low vigor, pitch tubes may be lacking but reddish boring dust will be seen in bark crevices and in spider webs on the bark and at the base of the trees.

New broods often leave the trees when the foliage is only slightly faded or yellow. When the crowns turn red, the beetles have usually left (except during winter).

Control. -- When beetle populations are rising, control measures should be applied immediately and pushed forward vigorously. Salvage logging will check beetle populations only if the infested trees are cut and taken to the mill before the beetles have left. Slabs of infested bark knocked off in felling and skidding should be destroyed.

Where rapid salvage logging is impractical, the infested trees should be immediately cut and sprayed with benzene hexachloride (BHC). Only pines with living broods within them should be treated. These are usually green-topped or slightly faded trees.

The recommended spray for controlling the southern pine beetle is 0.25 percent gamma isomer benzene hexachloride in No. 2 diesel oil. This may be prepared as follows:

Stir one gallon of benzene hexachloride concentrate (containing about one pound of gamma isomer per gallon) into about 50 gallons of No. 2 diesel oil. The spray costs about 20 cents per gallon.

BHC concentrate can be purchased in 5-gallon containers and 53-gallon drums. One gallon of the spray mixture will treat about 100 square feet of bark surface. All surfaces should be covered thoroughly--until drops begin to form and run off. Logs should be turned so that the underside can be sprayed.

IPS ENGRAVER BEETLES

Ips avulsus, Ips grandicollis, and Ips calligraphus

Importance. -- The 3 common species of Ips beetles kill sapling and larger pines that have been weakened by drouth, fire, hail, ice storms, or other causes. They can almost always be found in lightning-struck trees. Logging slash, fresh-cut logs, and fire-scorched trees are especially attractive to them.

Infested trees are typically scattered through the forest, but the beetles may kill clumps of trees when conditions are in their favor. Cumulative damage is very high, and is accentuated by the fact that the beetles carry a blue-stain fungus that degrades the lumber cut from infested trees.

Habits. -- All three species girdle the cambial region, but they are unlike in size and they sometimes show a preference for different parts of the tree. Young adults are yellow, older ones nearly black.

Ips avulsus, the smallest species, is not quite 1/8-inch long. It attacks the crowns and frequently the trunks of trees of all sizes. Populations normally build up in fresh logging slash and spread to crowns of nearby timber when logging ceases or when the standing trees have been weakened by drouth or some other disturbance. They sometimes kill one branch at a time but when abundant may suddenly attack the entire crown. When they are particularly active, they may make stands more susceptible to other Ips beetles and the southern pine beetle. This species has recently displayed signs of unusual aggressiveness. Land-owners should take pains not to overlook it. Its presence in the crowns may not be noticeable except to an experienced spotter or with the aid of binoculars.

Ips grandicollis is medium-sized (about 3/16-inch long). It commonly attacks the middle and upper trunk. Ips calligraphus, almost 1/4-inch long, generally prefers the lower trunk. Both species, however, may be found on any part of the trunk and larger branches.

The three species may work together in the same tree, their tunnels overlapping, or they may work independently or in succession. They may also become associated with southern pine beetles and the black turpentine beetle. There may be 4 or 5 generations per year.

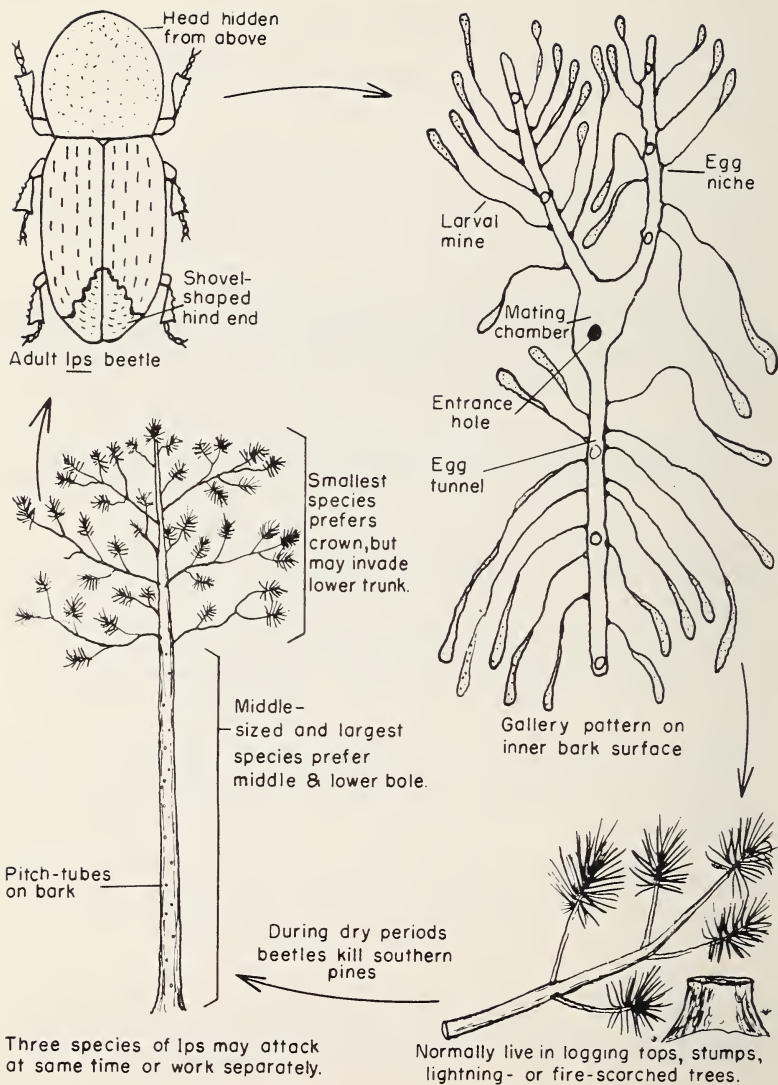


Figure 2.--*Ips* engraver beetle.

Signs of attack. -- Trees infested with Ips will usually have numerous pink or red-brown (sometimes whitish) pitch-tubes, about the size of a wad of gum, on the bark of the branches or trunk. In trees of low vigor, however, pitch-tubes may be lacking, and the earliest signs of attack will be reddish boring dust in bark crevices and in spider webs at the base of the tree.

If the crowns alone are infested, pitch-tubes will be difficult to see and the foliage may be only a trifle faded when the broods are ready to leave. Sometimes the crowns turn yellow or red, limb by limb.

The egg tunnels, engraved on the inner bark and the surface of the wood, are more or less straight. They are typically Y- or H-shaped and run parallel to the grain of the wood. The egg tunnels are generally free of boring dust. Larval feeding mines--wavy, somewhat indistinct, and filled with boring dust--lead from the egg tunnels.

Control. -- When beetle trees are widely scattered, control is generally too expensive to be practical. However, if the attack seems to be getting out of hand, currently infested trees should be salvaged before the beetles have left, and the slabs should be burned at the sawmill. Where early salvage is impossible, the trees should be felled and the tops, trunks, and stumps sprayed. This "cut-spray" treatment costs \$1.20 to \$2.50 or more per tree, depending upon the size and accessibility of the trees and the concentration of the outbreak. When logging in a drouth year or on poor sites, it is generally a good precaution to avoid intermittent cutting and to burn or spray the tops and slash immediately.

The BHC formulation recommended for the southern pine beetle will also control Ips.

The general strategy in control is to keep ahead of the insect by treating only trees that have broods in them. Usually crowns are still green or faded when broods are ready to leave. By the time the foliage has turned red, beetles have usually, though not always, left. Do not make the mistake of treating vacated red-tops and overlooking nearby infested green-tops.

Where drouth is the primary cause of unusual Ips beetle activity, soaking rains will generally stop the infestation.

BLACK TURPENTINE BEETLE

Dendroctonus terebrans

Importance. -- Formerly considered of little importance, the black turpentine beetle has in recent years become a serious forest pest capable of killing the best trees in a stand. It is especially prevalent following fires, heavy cutting, drouths, windstorms, and other disturbances to the forest. The beetle has also become a major problem in naval stores areas. Turpented trees with virgin faces installed with a broad axe and intensively worked trees in dense stands are particularly susceptible to attack. The increased use of mechanized equipment may have something to do with the insect's new importance in logging areas, since heavy vehicles not only damage the residual trees but compact the soil and injure the roots.

Habits. -- The adults are dark-brown or black beetles 1/4- to 1/3-inch long. They bore into the cambial region and lay eggs there. The larvae, creamy white grubs up to 1/3-inch long, feed in groups on the cambium, side by side, and eat out large patches between bark and wood. When the attack is light the tree usually recovers. When beetle broods are numerous they girdle the cambium and the tree slowly dies. At least 2-1/2 months are required to complete the life cycle of the beetle. Usually there are about 2 generations a year, but broods overlap.

The adult beetles are attracted by fresh resin and skinned or severely scorched bark. Populations may build up in fresh stumps and then spread to living trees. The beetle appears to prefer trees on low, flat, normally wet or poorly drained sites, especially during drouths. It is also common along woods roads and trails.

Signs of attack. -- The most obvious signs of attack are conspicuous pitch-tubes on the lower trunk and stumps. The tubes are large--sometimes about the size of a walnut--and white to reddish in color. Older tubes have a sugar-like texture. Granular pieces of hard, whitish resin will be found on the ground below the pitch-tubes. The tunnels and irregular excavations beneath the bark are packed with sticky resin and red boring dust. When ambrosia beetles have entered the tree, their whitish boring dust will also be seen around the base.

Crown foliage color is not a satisfactory clue to the activities of this pest, because heavy populations may develop in an area before the trees are killed.

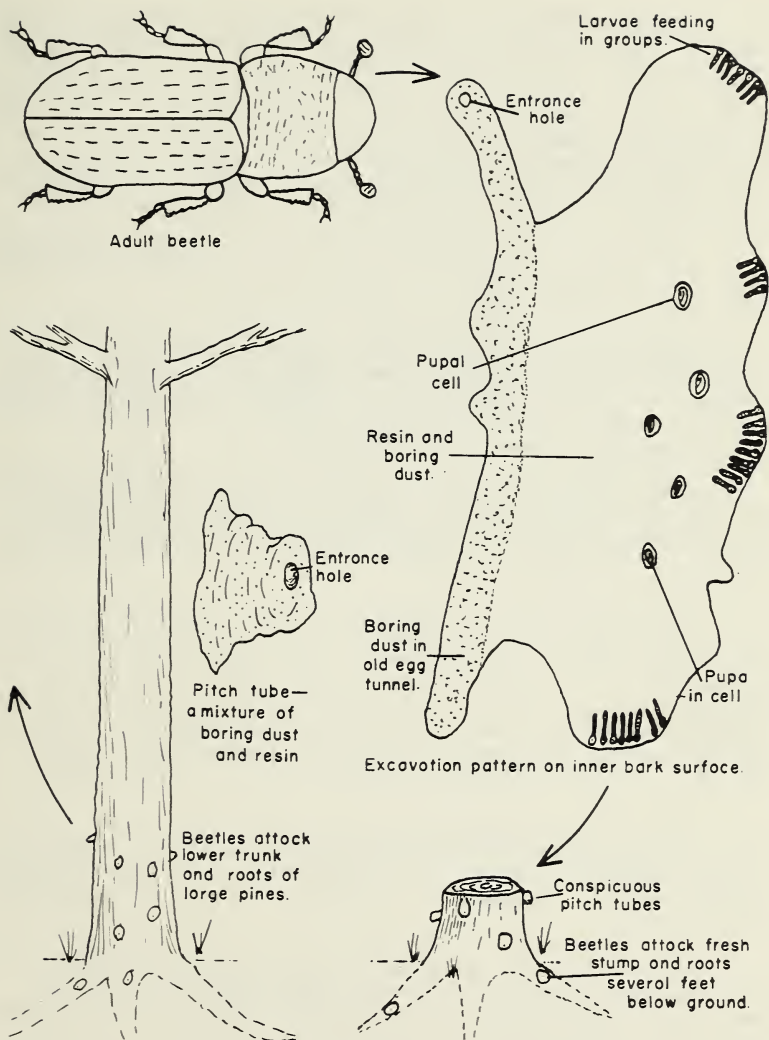


Figure 3.--Black turpentine beetle.

Control. --Buildup to outbreak proportions is comparatively slow, and if stands are watched carefully, many attacks can be headed off. Unusual disturbances to the stand should be avoided, so far as possible. Logging should be done in such a way as to minimize injury to the remaining trees. If logging is carried on when outbreaks are likely, the green stumps and areas of skinned bark on remaining trees should immediately be sprayed with BHC. Spraying is especially useful where heavy logging equipment is used on poorly drained soils or where pre-cutting of polewood is done a few months before crop trees are removed.

Seed trees or other valuable trees in outbreak areas can be protected by spraying the lower 4 feet of the trunk and exposed roots with BHC; a single treatment will last 6 months or more.

If many trees are being killed or if large numbers of active pitch-tubes indicate a rising population, control measures must be taken. Where the dying trees are too scattered to be salvaged, or when salvage cutting cannot be done immediately, the only recourse is to spray the stumps and infested butts of attacked trees with BHC.

Where salvage is feasible, the dead or dying trees should be cut and milled as soon as possible; the slabs from the butt logs should be burned in the millyard. Stumps and the butts of all remaining infested trees should be sprayed with BHC.

When trees are being marked for salvage, those having the white dust of ambrosia beetles around the base may be considered doomed to die. Lightly infested trees can often be saved by prompt spraying. Much sympathy is due the forester who has to decide which trees to cut and which to try to save. His task is somewhat easier if several salvage cuttings are possible within the year; then light marking can be used in the hope that many infested trees will recover. Where only one salvage cut can be made, heavy marking of infested trees may be necessary.

Sprays to be used on the turpentine beetle should contain two to four times the amount of BHC recommended for the southern pine beetle. The cost will be 10 to 30 or more cents per stump or butt, depending on the bark roughness, diameter, accessibility, and concentration of trees to be sprayed.

Before treatment, debris and litter should be scraped from around the base of the tree or stump, so that the spray can penetrate the vicinity of the larger roots. All surfaces of infested bark, including the crevices, should be sprayed to the point of run-off. A second pass is then made around the tree or stump, directing the spray at the basal

6 inches to add more insecticide to the soil. In thick-barked pines, especially slash pine in ponds and draws, it is usually necessary to scrape moss and loose bark off the lower trunk of the tree. Spraying should not be done during or after a rain when the bark is wet.

In naval stores timber, spotting can be facilitated by providing the chippers and dippers with marking tape or narrow strips of white cloth each 36 inches long. When an attacked tree is found, the tape or strip is fastened around the trunk at eye level or higher. These marked trees can be easily located for spraying after they have been reported in a general area.

When infested turpentine-faced trees have been sprayed, chipping should be avoided for the next two periods. This is recommended so that the trees may have a better opportunity to recover from the beetle attack and the spray. If possible, trees with numerous attacks should not be chipped for the remainder of the season.

As long as beetles are active in the area, trees should be repeatedly inspected and sprayed when necessary to keep the population low. This is quite easy in naval stores timber, where the important job of spotting newly attacked trees can be accomplished in the normal course of chipping and dipping operations.

SOUTHERN PINE SAWYER

Monochamus titillator

Importance. -- Larvae of the southern pine sawyer tunnel through the sapwood and heartwood of green logs and dead or dying pines, degrading the lumber and opening the way for decay fungi. The insect is particularly destructive to windthrown and fire-killed timber and to logs left in the woods or held in storage during the warm months.

Habits. -- The larvae are legless, somewhat flattened white grubs up to two inches long. The thoracic or front segments of the body are slightly wider than the abdominal segments. The adult is a beetle, mottled greyish-brown, $3/4$ to $1-1/4$ inches long. The antennae are sometimes two or three times as long as the body.

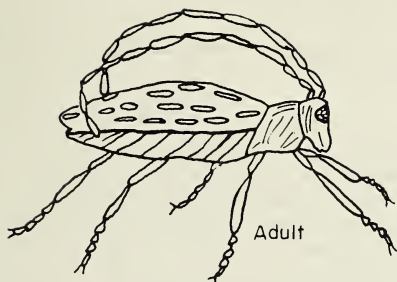
The female beetles cut funnel-shaped pits in the bark surface and deposit eggs in the phloem. Upon hatching, the larvae feed in the cambium and sapwood and later tunnel deep into the sapwood and heartwood. Eventually they return almost to the surface and construct a pupal cell. Following transformation, the adults chew a hole to the surface and emerge. Two or three generations a year are produced in the South.

Signs of attack. -- The earliest signs of attack are the funnel-shaped egg niches in the bark. Beneath the bark, dense, brownish frass and coarse-shredded, excelsior-like wood shavings are present. Circular pencil-size holes in the wood and bark are a sign that adults have emerged.

Control. -- Rapid salvage and utilization of dead and dying trees or green logs will reduce losses. If the beetle populations are large and logs must be stored, damage may be prevented by promptly spraying the bark with benzene hexachloride (BHC) in fuel oil.

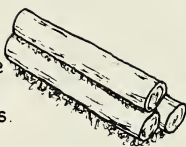
The recommended spray is prepared by stirring one gallon of BHC concentrate (containing one pound of gamma isomer per gallon) into 49 gallons of No. 2 fuel oil. The finished spray costs approximately 20 cents per gallon. The concentrate can be purchased in 1, 5, and 55-gallon containers.

One gallon of the finished spray will treat about 100 square feet of bark surface. All surfaces should be covered thoroughly--until drops begin to form and run off. Logs should be turned so that the under sides can be sprayed.

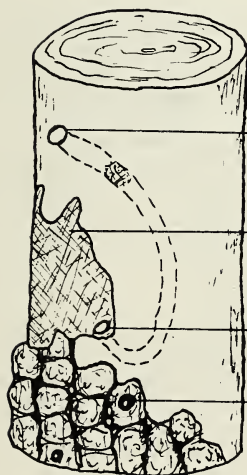


Adult

Excelsior-like
frass under
infested logs.



Attack dead or dying
trees and green logs.



Round pencil-
size hole.

Irregular gouging on
surface of sapwood
& coarse excelsior-
like wood shavings.

Oval hole made
by larva as it
enters wood.

Funnel-shaped egg-
niche in outer bark.



Larva

Figure 4.--Southern pine sawyer.

TURPENTINE BORER

Buprestis apicans

Importance. -- Larvae of the turpentine borer attack the basal portion of pines that have been turpented, fire-scarred, or injured mechanically. Larval boring may weaken the trees so that they break off in windstorms. When infestations are severe, 3 to 6 feet of the butt log may become unfit for lumber. Sound, healthy trees are seldom attacked.

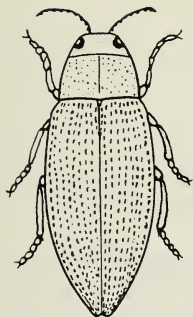
Habits. -- The legless larvae are elongated white grubs up to 1-1/2 inches long. They appear flat-headed because the thoracic or front segments of the body are distinctly wider than the abdominal segments. The beetle is grayish-bronze with a greenish metallic luster, 1-1/4 inches long.

The female lays eggs in checks in drywood of turpented trees or trees that have been fire-scarred or otherwise injured. The larvae mine extensively in the sapwood and heartwood. The life cycle is completed in approximately 3-1/2 years.

Signs of attack. -- Often the earliest signs of this beetle are elliptical emergence holes in dry turpentine faces or fire scars, or tunnels in trees broken off by wind. When infested trees are sawn into lumber, larval tunnels filled with fine, tightly-packed boring dust and resin are exposed.

Control. -- The turpentine borer has been a major pest in the naval stores region. However, although many worked-out trees still remain in the forest as breeding places for this insect, modern naval stores practices, and particularly the prompt harvest of worked-out trees, have virtually eliminated severe infestations. Prescribed burning to decrease wildfire hazards and to reduce the number of charred, cracked faces on trees worked for naval stores has also helped.

Occasionally, tree trunks will require spraying to protect them, and the recommended spray is BHC in No. 2 fuel oil. It is prepared by stirring two gallons of BHC concentrate (containing one pound of gamma isomer per gallon) into 48 gallons of the fuel oil. The finished spray costs approximately 24 cents per gallon. One gallon of the finished spray will treat about 100 square feet of surface. All surfaces subject to attack should be covered thoroughly--until drops begin to form and run off.

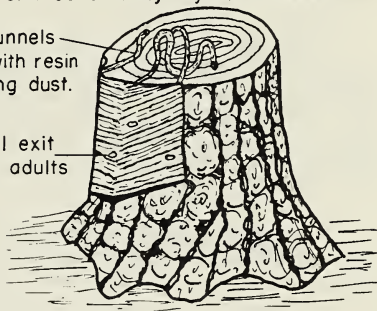


Adult

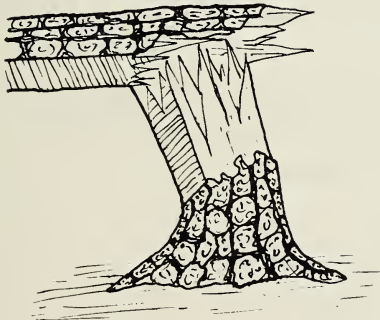
Attack turpented, fire-scarred,
or mechanically injured trees.

Larval tunnels
packed with resin
and boring dust.

Elliptical exit
holes of adults



Larval feeding may
weaken tree enough
to cause wind breakage.



Larva

Figure 5.--Turpentine borer.

AMBROSIA BEETLES

Platypus spp.

Importance. -- Ambrosia beetles of the Platypus group attack weakened, dying, or freshly cut pines and unseasoned pine lumber. They degrade the wood by boring small holes and introducing a black stain.

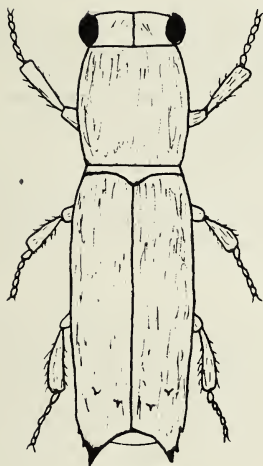
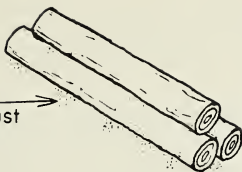
Habits. -- The adults are reddish-brown, elongated beetles, approximately 1/4 inch in length. The beetles bore into the sapwood and heartwood of logs or lumber, making pin-size holes that usually are darkly stained by an ambrosia fungus upon which the adults and larvae feed. The female lays eggs in small clusters in the tunnel, and the developing larvae excavate small cells extending from the tunnel parallel with the grain of the wood. There are several generations each year.

Signs of attack. -- Small piles of yellowish-white fluffy boring dust accumulate around the base or in bark crevices of infested trees, stumps, and logs. In lumber the characteristic pin-size holes surrounded by black stain may be observed extending into the wood.

Control. -- Prompt utilization of dead and dying trees and rapid seasoning of lumber will reduce or eliminate losses. Where these courses are impractical, green logs may be protected for several months by spraying with BHC in No. 2 fuel oil, mixed in the same proportion as recommended for the turpentine borer.

Green lumber may be protected by dipping it in a water emulsion prepared by mixing two quarts of BHC emulsifiable concentrate (containing one pound of the gamma isomer per gallon) with 50 gallons of water.

Piles of
fine boring dust



Adult

Adults attack logs,
lumber, and weak-
ened trees.



Very fine white boring dust
at base of tree.

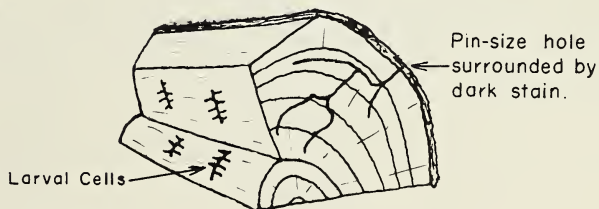


Figure 6.--Ambrosia beetle.

NANTUCKET PINE TIP MOTH

Rhyacionia frustrana

Importance. --The larvae of the tip moth kill buds and twigs of young planted and natural loblolly and shortleaf pines. Vigorous seedlings may grow fast enough to overcome the effects of the insect, but severe and repeated setbacks may result in stunted, deformed trees of little value, especially on poor sites.

Habits. --The adults are about 1/4-inch long, copper-colored with silvery markings on their wings. They are active from February until late fall, but are not often seen unless disturbed. Eggs are laid on the needles and twigs. The larvae are yellowish to pale brown, worm-like, and up to 1/3-inch long. They feed within the buds and twigs and later change into brown, capsule-like pupae about 1/4-inch long.

Signs of attack. --Terminals and branches of infested pines have many brown, dead, hollow buds and stunted twigs. A crust of hard, whitish resin can be seen between the buds, needles, and twigs; and the insides of dead buds and twigs contain granular, brown, manure particles.

Control. --The insect is so widespread that few young stands are free of it. Control is difficult at all times, treated areas often becoming re-infested. Severely infested plantations can often be pulled through by thoroughly spraying the foliage with DDT when the moths appear in February or March. Since moths are difficult to find on the trees, it is suggested that infested branch tips be caged outdoors during the late winter, and moth emergence used as a guide to proper timing. The spray is prepared by stirring 1 gallon of 25 percent DDT emulsifiable concentrate or 4 pounds of 50 percent DDT wettable powder in 50 gallons of water. Spraying in early spring will destroy most of the existing population and permit the trees to make a spurt of growth that will lessen damage from attacks later in the season. A second spraying at the next flight period of the moths, usually in early June, is often advisable. Treatment for 3 or 4 successive years may be needed.

First flight in February or March.
About 3 or 4 flights each summer.

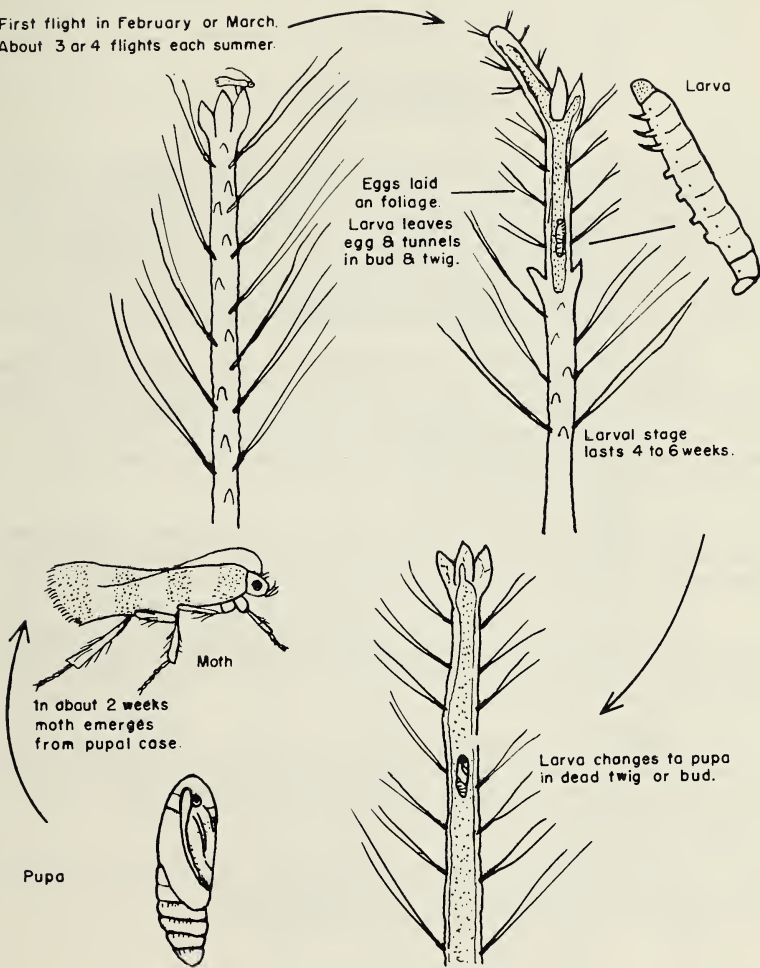


Figure 7.--Nantucket pine tip moth.

WEEVILS

Hylobius pales Pachylobius picivorus

Importance. --Adult weevils girdle pine seedlings planted or growing naturally in areas where older pines have recently been cut or killed by fire, bark beetles, or other causes. The pales weevil is a pest in most of the eastern U. S., but is becoming more apparent and increasingly important in the South as a result of more widespread clear-cutting and planting practices. A related species, Pachylobius picivorus, closely resembles the pales weevil and is apparently of equal importance in the South.

Habits. --The weevils are attracted to freshly cut pine stumps and scorched pine trees in the spring and fall and chew the tender bark of seedlings in the vicinity. They lay eggs in the root bark of stumps and scorched trees and infrequently beneath the bark of logs and slash. The larvae develop under the bark, and when the new adults emerge they feed on nearby seedlings.

The adults are brown to black, 1/4- to 1/3-inch long, with a prominent snout. The grubs are creamy white and about 1/4- to 1/3-inch long. They make oval chip cocoons of finely shredded wood beneath the bark.

Signs of attack. --The weevils may eat patches of bark, or they may girdle the stem completely by removing most of the bark. Attacked seedlings wither and die. Heaviest feeding is in the spring and early summer and sometimes in the fall.

Control. --Weevil damage is most likely to be severe when planting follows immediately after fall or winter cutting or severe burning. Areas cut during the spring and early summer can be planted the following winter without much danger of serious loss.

Preliminary tests indicate that where weevil populations are heavy, damage can be greatly reduced by dipping the tops of planting stock in a 2-percent emulsion of aldrin, dieldrin, or heptachlor.

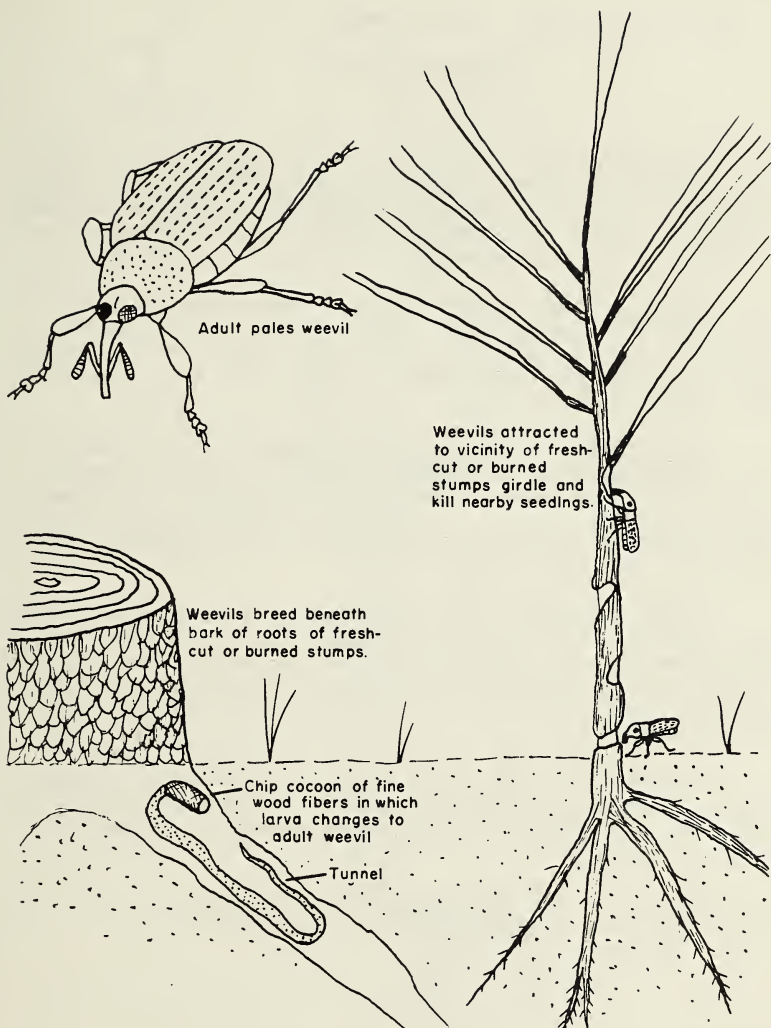


Figure 8.--Pales weevil.

WHITE GRUBS

Phyllophaga species

Importance. -- White grubs, the larvae of the common May or June beetle, are among the worst insect pests of pine nurseries. They also damage young pine plantations and natural regeneration in old fields or sod-land. It seems likely that grubs cause some of the mortality laid to drouth or vegetative competition.

Habits. -- Beetles appear in spring and early summer and most species feed on hardwood foliage. Females lay their eggs in the soil, and the larvae feed on roots of pine seedlings, grasses, and other plants. Grubs reach an inch or more in length. The life cycle varies from 1 to 3 years, depending on the species.

Signs of attack. -- Attacked seedlings wither and turn yellow or brown. Since the grubs destroy most of the roots, the dying trees can easily be pulled from the soil. The grubs can usually be found beneath the soil surface near dying or recently killed seedlings. Large numbers of beetles attracted to lights in the spring may indicate trouble later the same year or the year following.

Control. -- Infested nursery beds should be treated, before sowing, with the equivalent of 10 pounds of actual chlordane per acre. Dusts, wettable powders, and emulsifiables have all been used with good results. To insure that the insecticide will penetrate the soil, it should be applied just before a rain or wet down promptly with the nursery sprinklers and worked into the soil.

Before seedlings are planted, especially in grasslands, the soil should be sampled for grubs. In grub-infested areas, planting should be avoided. Valuable planted seedlings may be protected by treating the infested soil with chlordane.

Preliminary tests are being made in the use of aldrin, heptachlor, and other chemicals as protective root dips for seedlings.

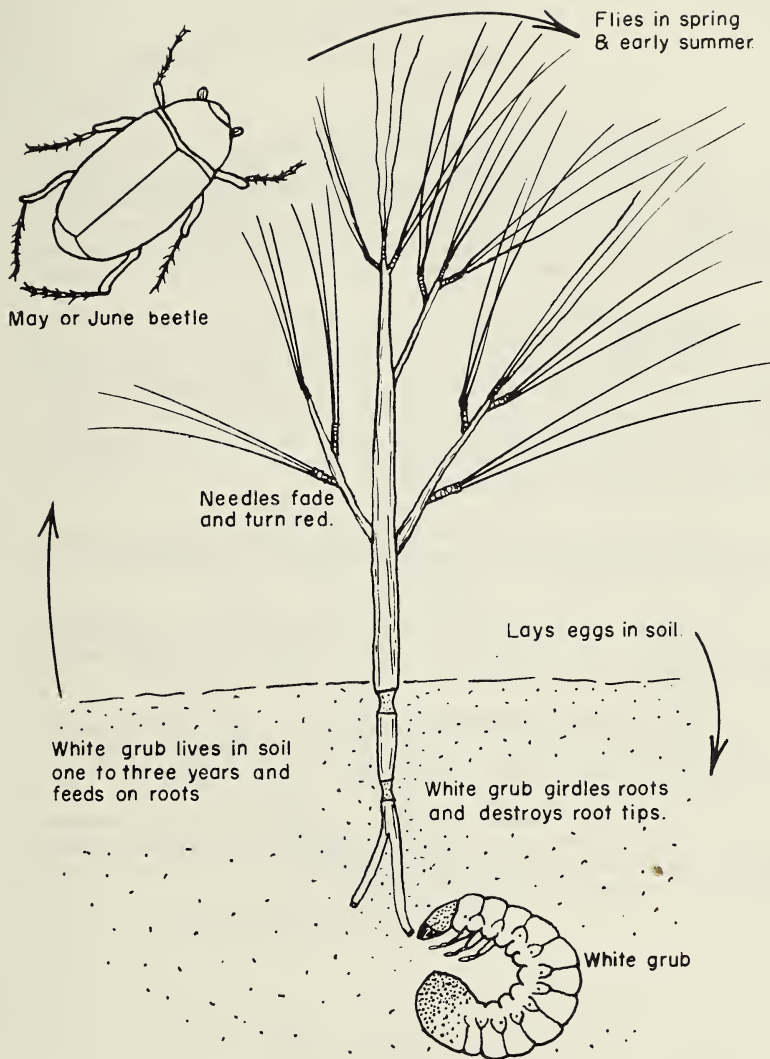


Figure 9.--White grubs.

PINE SAWFLIES

Neodiprion species

Importance. --At least three species of sawflies attack southern pines: the redheaded pine sawfly (Neodiprion lecontei), the loblolly pine sawfly (N. taedae linearis), and a little-known black-headed species, N. exitans. All have caterpillar-like larvae that chew the needles of pines of all sizes. Severe infestations will stunt or malform young trees and sometimes kill them. Larger trees suffer severe growth loss.

Habits. --The habits of all three species are similar. The adult female cuts slits in pine needles and deposits an egg in each slit. The larvae usually feed in clusters. When full grown they are almost an inch long and hairless; their color differs with the species. When they are fully developed, they make shiny-brown, oval cocoons about 1/3-inch long. The cocoons are usually in the soil or on it, less frequently in bark crevices or in the foliage. There may be one to several generations each year, depending upon the species.

Signs of attack. --The larvae themselves, their cocoons or excrement pellets under the tree, or the chewed needles and needle stubs are obvious signs of attack.

Control. --If defoliation is severe enough to warrant, infestations can be controlled by spraying with DDT, preferably when the larvae are young and more easily killed.

For aerial applications or truck-mounted mist blowers, dissolve 1 pound of technical DDT in a suitable solvent and dilute with fuel oil to make 1 gallon of insecticide: apply at the rate of 1 gallon per acre.

For garden or knapsack sprayers, mix 50-percent DDT wettable powder in water at the rate of 1 pound of powder to 50 gallons of water, and thoroughly spray all infested foliage. The mixture must be constantly agitated to prevent the DDT from settling out.

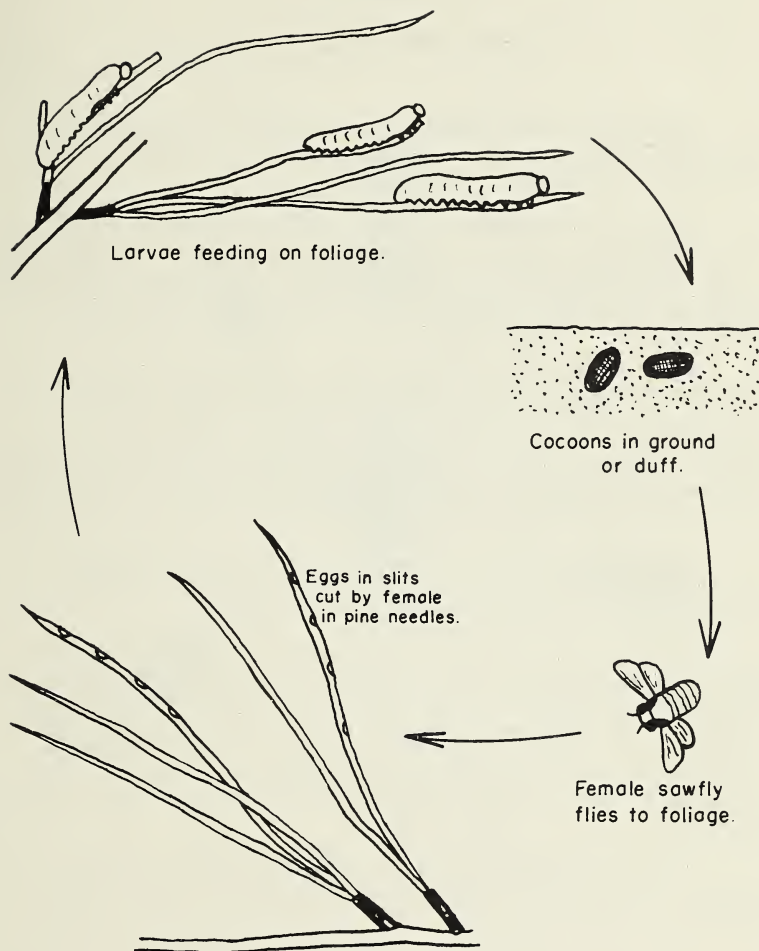


Figure 10.--Pine sawflies.

PINE WEBWORM

Tetralopha robustella

Importance. -- Infestations of pine webworms are usually light and scattered, but sometimes young pines in nurseries and plantations are defoliated and killed.

Habits. -- The full-size larva is a caterpillar approximately 4/5-inch long. The head is tan with darker markings, and the body light brown with dark longitudinal stripes running down each side. The adult is a moth with a wingspread of approximately one inch. The forewing usually is grey in the middle portion and darker at the base and tip.

Eggs are laid on seedlings or small trees between May and September. The caterpillars live in silken webs surrounded by masses of excrement pellets. They feed on the needles. Normally each web contains one or two larvae, but occasionally twenty-five or more may be found. After it completes feeding, the caterpillar drops to the ground and makes an oval pupal cell slightly below the soil surface. Generally, two generations are produced each year in the South.

Signs of attack. -- Defoliation and masses of silk webbing surrounding pellets of excrement are the most common signs of attack. Occasionally dead defoliated seedlings may be present.

Control. -- When populations are high or when valuable nursery stock becomes infested, chemical control may be necessary. Mix 50 percent DDT wettable powder in water at the rate of 1 pound of powder to 25 gallons of water, and thoroughly spray all infested foliage. The mixture must be constantly agitated to prevent the DDT from settling out. The finished spray costs approximately 2 cents per gallon. Fifty percent DDT wettable powder can be purchased in 4-pound and 50-pound containers.

As DDT may aggravate mite troubles it is well to include a miticide or to watch seedlings and be ready to spray if mites become a problem.

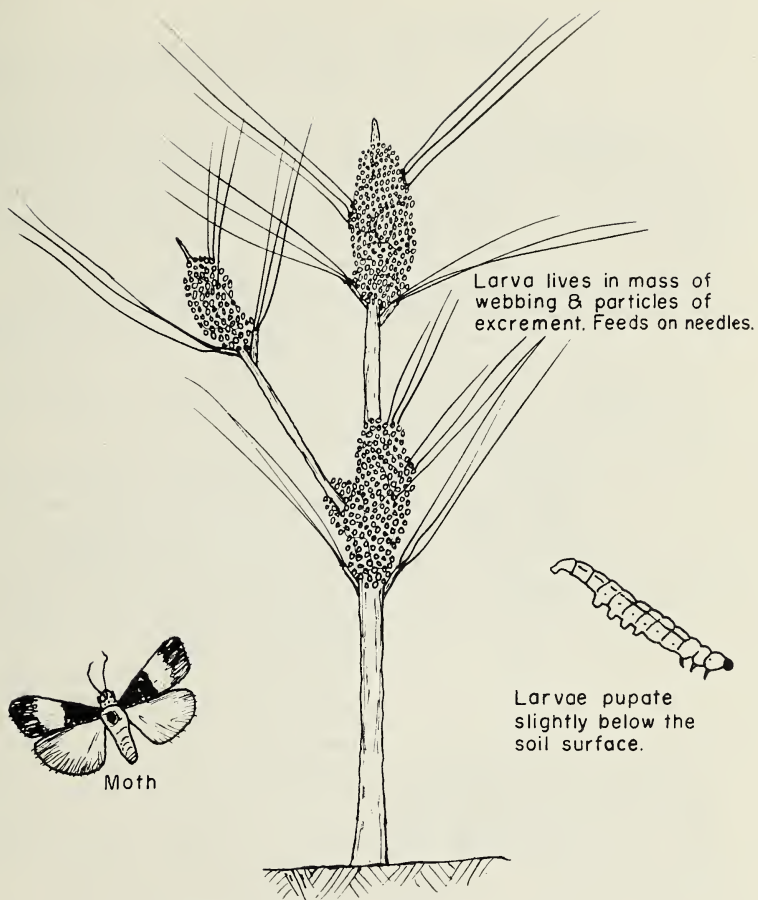


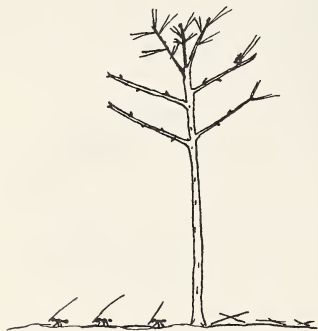
Figure 11. --Pine webworm.

TEXAS LEAF-CUTTING ANT

Atta texana

Importance. --The Texas leaf-cutting ant, or town ant, is one of the worst enemies of pine seedlings in east Texas and west-central Louisiana. Where ant towns are numerous, they must be eradicated before pines can be established. The ants strip the needles and leaves from a variety of plants, including pine and hardwood trees and many field crops. Large trees may be defoliated within several days, and small plants within a few hours. Pines are damaged most severely during the winter when other green plants are scarce. Trees of sapling size or larger usually survive, but seedling stands are often wiped out.

Habits. --The ants cut the leaves or needles into fragments and carry them below ground to make the "soil" for growing a fungus that is the only known food of these insects.



Texas leaf-cutting ants can defoliate pine seedlings very rapidly. The ants carry the needles over their heads.

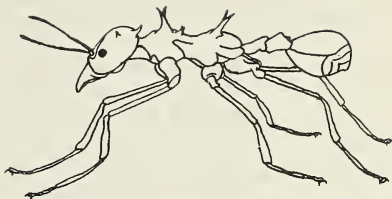
The nest is made up of a large number of circular or semi-circular mounds, each with a funnel-like opening. A colony, or town, may cover from several square feet to a quarter of an acre or more, depending upon its age.

During their foraging, the ants clear trails that resemble miniature highways. They file along these trails, carrying leaf or needle fragments like tiny parasols. Defoliation by these ants appears very much like the work of several other leaf-chewing insects, particularly sawflies. Usually the injured trees are within sight of one of the colonies, or the ants themselves may be seen cutting the needles. Bits of the needles are left about the base of the trees and along the trails, which often extend several hundred feet out from the colony. During late fall and winter the fresh mounds of subsoil in the towns are very conspicuous.



Typical mounds of the Texas leaf-cutting ant.

In May and June, winged ants swarm and mate, and the females (queens) establish new nests. Upon leaving her home colony each female carries in her mouth a small amount of fungus, which she cultures and subsequently uses to feed her young.



The activities of the ants are influenced by the temperature. They forage during mild days in winter, and mostly at night in the summertime. The workers are inactive on cold, wet, or cloudy days, particularly in the morning hours.

The distribution of the ants is apparently limited by soil type. Most colonies are on sandy soil. A deep sandy surface soil underlain by a layer of clay seems to be preferred. On sloping ground, most colonies occur on southern and western exposures.

Control. --When signs of the ants are found on areas to be planted or seeded to pine, a systematic effort must be made to locate all nearby colonies. Scouting is easiest during the fall and early winter, when the mounds are not hidden by vegetation. As they are located, colonies should be marked with a stake or other device to guide the control crews to them.

Fumigation with methyl bromide is the most effective control devised so far. At warm temperatures and atmospheric pressure, methyl bromide is a colorless gas, poisonous to humans as well as to ants but neither combustible nor explosive. Being about 3-1/2 times heavier than air, it penetrates into the underground chambers of the colony. It may be obtained liquified under pressure in one-pound cans.

The best time to apply the gas is in late fall or early winter, on cool, wet, or cloudy mornings, when the ants tend to remain underground. In general, applications during warm months have been unsatisfactory, probably because the colonies are less centralized and there is more chance of the gas failing to reach all the chambers and galleries.

The methyl bromide is applied with a special device consisting of a valve and a piece of flexible tubing attached to the can:

1. Insert about two feet of the tubing into one of the central openings to the colony. The mound may have to be cleared away to facilitate access to the hole.
2. Lightly tamp some soil around the tube and press on the packed soil with one foot, taking care not to pinch the tube. This will prevent the tube from whipping out of the hole when the valve is opened and the pressure in the can is released.
3. Hold the inverted can with one hand, open the valve with the other, and allow the gas to escape into the colony. The can may either be discharged entirely into one hole or divided among two to four holes of the same colony.

A one-pound can of gas usually is enough to kill the ants in a colony of average size--that is, one occupying about 600 square feet of surface soil. Larger colonies, or average colonies on loose, porous soils, may require two pounds of gas. If the colony is on a hillside, the gas should be applied to one of the uppermost openings rather than to a central hole.

Colonies should be checked two to four weeks after treatment. Any sign of ant life indicates that another fumigation is necessary.

PINE COLASPIS BEETLE

Colaspis pini

Importance. --Feeding by the pine colaspis beetle produces a spectacular browning of the needles similar to that caused by fire. The beetle is not known to kill pines and apparently has slight effect on their growth. Infestations occur sporadically throughout the South.

Habits. --The beetles are oval-shaped, one-fourth inch long, with brown stripes and minute greenish jewel-like specks over the body. From May to early July they feed on the one-year-old needles of young pines and occasionally on needles of larger trees. At times several hundred acres of natural and planted saplings may be attacked, but infestations usually are spotty, with the affected trees occurring singly or in groups throughout the area. One generation is produced each year.

Signs of attack. --The earliest evidence of attack is the presence of small drops of resin on the needles. At night the resin drops are highly reflective and appear to be luminescent when a light is flashed on them. The foliage later becomes discolored, and an examination will reveal irregular saw-like edges along the needles, particularly those in the upper half of the crown. By late summer new growth again makes the trees look normal.

Control. --Colaspis beetles may reach alarming populations in an area one year and then appear elsewhere the next. Chemical control usually is not justified in the forests, but ornamental trees can readily be protected with a DDT spray. The spray should be applied when the first symptoms of beetle activity appear in late May or early June.

To prepare the spray, stir one pound of 50 percent DDT wettable powder into 50 gallons of water, and keep the mixture well agitated while it is being applied. The finished spray costs approximately 1 cent per gallon. Fifty percent DDT wettable powder can be purchased in 4-pound and 50-pound containers. A 10 percent DDT dust may be used instead of the spray.

DDT may aggravate mite troubles. It is advisable to include a miticide or to watch foliage and be ready to spray if mites become a problem.

OTHER PINE INSECTS

Pine needle miner (Exoteleia sp.). -- The larvae burrow into the needles of longleaf and other pines, leaving the outer part of the needles dead and semi-transparent. When infested trees are observed from a distance, the foliage looks brown or yellow. The larvae are light brown with black heads and are approximately 3/16-inch long. The adult is a brownish-yellow moth with silvery scales. Damage to pines is presently considered of minor importance, although some growth loss may be expected.

Pine pitch midge (Retinodiplosis sp.). -- The midge is a delicate fly usually less than 1/4-inch in length. The orange, legless larvae occur singly or in groups in small globs of resin exuding from swellings on branches or twigs of pines. In some years they are common and some twigs may be killed. They probably cause little damage, however.

Scale insects (Coccidae). -- Scales are soft, waxy insects that suck sap from plant tissues. The adult females hardly resemble insects, as they are scale-like and do not move. The newly hatched young are microscopic and are known as crawlers. They move about over the needles and twigs.

The pine needle scale (Phenacaspis) is a white, elongate scale about 1/8-inch in length. It occurs on the needles. The pine bark scale (Toumeyella) is a brown species about the size of a pea, and usually occurs in crowded masses on the twigs and branches.

Heavily infested pines become pale-green or yellow and covered with a sticky "honeydew" excreted by the insects. A black, sooty mold often grows over the honeydew and increases the unsightliness of the foliage. Occasionally small plantation trees are killed.

Control is generally not recommended under forest conditions. On ornamental pines, scales may be destroyed by spraying with malathion, following directions of the manufacturer. The spray is most effective when the insects are in the crawler stage.

Aphids (Aphidae). -- Aphids or plant lice are light green or brown soft-bodied insects, varying in size from 1/16- to 1/4-inch. Both winged and wingless forms occur. The aphids suck sap from the needles, bark, and sometimes the roots. Usually infestations attract attention because of the dropping of sticky honeydew as the aphids feed. Very little is known of the overall effects on forest trees by large and frequent aphid

populations. Undoubtedly they cause growth loss and some malformation of infested parts.

Chemical control is generally unnecessary or impractical under forest conditions. Where shade trees and ornamental pines are heavily infested, a spray of 25 percent malathion emulsifiable concentrate diluted at the rate of one pint per 100 gallons of water will be satisfactory.

Spider mites (Tetranychidae). -- Mites are not insects but animals related to ticks and spiders. There are many species.

Mites are among the most persistent of plant-feeding pests; they cause foliage to fade and later turn brown. Damage is most severe during hot, dry weather. When infestations are heavy, mites can be found all over the needles and twigs, running over the fine webbing they spin. Though they are very small, their presence may be easily determined by jarring them off the foliage onto a sheet of white paper. If living mites are absent, their cast skins, egg shells, and webbing usually can be found on infested plants.

Infested pines growing under forest conditions may appear rusty brown, but usually recover following soaking rains. Mites may be removed from ornamental trees or shrubs by thoroughly and repeatedly washing the plants with a strong stream of water. Several of the newer chemicals used in mite control are malathion, aramite, kelthane, and DN-111.

